

State of Alaska Diabetes Control Plan



November 1999

State of Alaska
Tony Knowles, Governor

Department of Health and Social Services
Karen Perdue, Commissioner

Division of Public Health
Peter Nakamura, MD, MPH, Director



Section of Epidemiology
Diabetes Control Plan
November 1999

Table of Contents

Acknowledgments

Diabetes Control Plan

Introduction to Diabetes	1
What is Diabetes	
Scope of the Problem	3
Prevalence of Diabetes	
Deaths from Diabetes	
Complications of Diabetes	
Risk Factors for Complications of Diabetes	
Cost of Diabetes	
Opportunities for Prevention	7
Prevention of Diabetes Complications	
Physical Activity	
Overweight	
Goals and Objectives of the Plan	11
Health System Approaches	
Health Communications: Diabetes Awareness and Education	
Public Awareness and Education	
Professional Awareness and Education	
Community-Based Programs	
Diabetes Surveillance	
References.....	23

Recommendations for the Management of Diabetes in Adults

Quick Reference	
Recommendations for the Management of Diabetes in Adults	25
Classification of Diabetes	29
Screening for Diabetes	30
Hemoglobin A _{1c}	33
Diabetic Retinopathy	35
Foot Care	37
Hypertension	39
Prevention of Diabetic Nephropathy	41
Management of Dyslipidemia.....	43
Medical Nutrition Therapy.....	45
Self Monitoring of Blood Glucose (SMBG).....	47
Tobacco-Use Status and Counseling	49
Aspirin Therapy	51
Gestational Diabetes	53
Pre-Existing Diabetes-Preconception Counseling	55
Diabetes and Exercise	57
References.....	61

Acknowledgments

Diabetes Control Planning Committee Coordinator:

Judy M. Sberna, RN, BSN.....Section of Epidemiology, Alaska Diabetes Control Program

Diabetes Prevention and Control Planning Committee:

Jeanne Berger, RNAmerican Diabetes Association
Richard Berger, MDInternal Medicine, Fairbanks
Robert Breffleilh, MDTongass Regional Eye Clinic, Juneau
Tammy Brown, RD, CDEDiabetes Program, Alaska Native Medical Center, Anchorage
Kathy CapacciSoutheast Alaska Health Corporation, Juneau
Michelle CassanoAmerican Diabetes Association
Lois Coomer, RNElmendorf, Airforce Base, Anchorage
Nancy Cullinane, LPTJuneau Physical Therapy, Juneau
Ken DeanSoutheast Alaska Independent Living, Juneau
Jackie DebevecConsumer, Fairbanks
Mary EarpOrder of Amaranth, Fairbanks
Dawn Evans-LaFleurInterior Region Neighborhood Health Center, Fairbanks
Ann Fleenor, RNFairbanks Memorial Hospital, Fairbanks
LeeAnn FolsonOrder of Amaranth, Fairbanks
Pat Fox, RNInternal Medicine, Fairbanks
Cheryl HallSoutheast Alaska Independent Living, Juneau
Jan Harris, RNPROWEST, Anchorage
Verl Harrison, RNNurse Manager, Fairbanks Regional Health Center, Section of Public Health Nursing, Fairbanks
Bonnie Holm, RNNorth Pole Prescription Laboratory, North Pole
Dawn Jeffress, RNNorthstar Borough School District, Fairbanks
James JohnsonCreative Signs, Juneau
Kendall Kalhoi, RPhPrescription Center, Fairbanks
K.C. Kaltenborn, MDInternal Medicine, Anchorage
Jane Kelly, MDDiabetes Program, Alaska Native Medical Center, Anchorage
Mary KinseyAlders Gate Methodist Church, Juneau
Janice Koval, MDInternal Medicine, Anchorage
Joni LeetSoutheast Alaska Health Corporation, Juneau
Marge LingAlaska Native Sisterhood, Juneau
Kathy Lux, RN, CDEKetchikan General Hospital, Ketchikan
Denise McPhersonAlaska Pioneers Home, Juneau
Janelle MeadeJuneau Douglas School District, Juneau
Carol MorenoHospice & Home Care, Juneau
Don Novotny, RNBartlett Memorial Hospital, Juneau
Joan Nugent, RNKetchikan General Hospital, Ketchikan
Mary O'Bryan, RNSection of Public Health Nursing, Juneau
Corky Olson, RNSection of Public Health Nursing, Ketchikan

Patty Owen Alaska Behavioral Risk Factor Surveillance Survey,
Juneau

Walter Palkovitch, RN Chief Andrew Isaac Health Center, Fairbanks

Mark Peterson, MD Medical Director, Southeast Alaska Health Corporation

Rhonda Richtsmeier, RN Regional Nurse Manager, Southwest Region, Section of
Public Health Nursing

Milegros Rescober, RN Anchorage Neighborhood Health Center, Anchorage

Emily Saura McClory, RN Section of Public Health Nursing, Ketchikan

Connie Sedinger, RN Fairbanks Northstar Borough School District, Fairbanks

Annie Schapleigh Southeast Nutrition Activities & Counseling, Juneau

Linda Scharrat Division of Public Assistance, Juneau

Bette Seamon, RD Providence Alaska Medical Center

Young Shin, RD Geneva Woods Pharmacy, Anchorage

Barbara Sylvester-Pellet Healthy Kids, Medicaid Services Unit, Juneau

Molly Southworth, MD Internal Medicine, Alaska Native Medical Center,
Anchorage

Sandra Stringer Consumer, Fairbanks

Wilma Tagabon, LPN Southeast Alaska Health Corporation, Juneau

Lyda Travis Juneau Medical Clinic, Juneau

Mindy Tomazevic, RN, CDE Providence Alaska Medical Center, Anchorage

Betsy Turner-Bogren American Diabetes Association

Brad Whistler Medicaid Service Unit, Juneau

Tammy Williams, RN Fairbanks Memorial Hospital, Fairbanks

Tom Wilson, PAC Internal Medicine, Fairbanks

Donna Young, RN, CDE Valley Hospital, Palmer

Alaska Division of Public Health Planning Committee Staff:

Cathie Schumacher, MD, MPH Section of Epidemiology

Julie Feero Section of Epidemiology

Coleen Greenshields Section of Epidemiology

Bonnie Johnson, RN Section of Public Health Nursing

Sally Urvina, RN, ANP Section of Public Health Nursing

Glen Ray Section of Community Health and Emergency Medicine

Alaska Division of Public Health under the direction of:

Nancy Davis, RN Chief, Section of Public Health Nursing

Mark Johnson Chief, Section of Community Health and
Emergency Medicine

John Middaugh, MD Chief, Section of Epidemiology

Pam Muth Chief, Section of Maternal Child and Family Health

Peter Nakamura, MD, MPH Director, Division of Public Health, Juneau, Alaska

ALASKA STATE PLAN FOR THE PREVENTION AND CONTROL OF DIABETES

In August 1998, the Alaska Diabetes Control Program invited more than 60 health care professionals, advocates, health officials and people with diabetes to form the first statewide diabetes coalition with the intent to develop a strategic diabetes control plan. Four working groups were formed: Health Systems, Health Communications, Community Based Interventions, and Surveillance. Each group has met and developed the Plan's goals and objectives.

This is Alaska's first Diabetes Control Plan. Many of the goals and objectives are designed to specifically reduce the burden (i.e., premature mortality, morbidity, and economic costs) of diabetes among the estimated 14,000 Alaskans who are already diagnosed. Other goals and objectives address the benefits of early detection of diabetes. Finally, the plan includes goals and objectives designed to prevent diabetes among the general population. The implementation of the goals and objectives described in this plan will require the collaboration of many agencies and individuals across the state.

The Alaska State Plan for the Prevention and Control of Diabetes also includes "Recommendations for Management of Diabetes in Alaska." The Recommendations were adapted by the Health Systems working group using the American Diabetes Association Clinical Practice Guidelines, as a strategy to ensure the widespread application of accepted clinical practice recommendations. The "Recommendations for Management of Diabetes in Alaska" provide typical courses of interventions for the management of diabetes and are not fixed protocols. The individual management of diabetes should be determined by the health care provider and be based on the needs of the patient.

WHAT IS DIABETES?

The term diabetes describes either a deficiency of insulin or a decreased ability of the body to use insulin, a hormone secreted by the pancreas. Insulin allows glucose (sugar) to enter cells and be converted to energy. Insulin is also needed to synthesize protein and store fats. In uncontrolled diabetes, glucose and lipids (fats) remain in the bloodstream and, with time, damage vital organs and contribute to heart disease. There are four main types of diabetes.^{1,2,3}

Type 1 diabetes, previously called insulin dependent diabetes mellitus (IDDM) type I, or juvenile onset diabetes, accounts for 5 to 10 percent of all diagnosed cases of diabetes. Autoimmune reactions and genetic factors are most often involved in the development of this type of diabetes.¹

Type 2 diabetes, previously called non-insulin dependent diabetes mellitus (NIDDM) or adult-onset diabetes, accounts for 90 to 95 percent of all diagnosed cases of diabetes. Risk factors for type 2 diabetes include older age (40+), obesity, family history of the disease, prior history of gestational diabetes, impaired glucose tolerance, physical inactivity and race/ethnicity – people with African, Hispanic/Latino or American Indian ancestry are at particularly high risk for type 2 diabetes, as are some Asian and Pacific Islander populations.^{1,2}

Maturity-onset diabetes of the young is a relatively uncommon subtype of type 2 diabetes characterized by an early age onset and autosomal dominant inheritance. Maturity-onset diabetes of the young is most often diagnosed between the ages of 9 to 13 years. Maturity-onset diabetes of the young is not associated with obesity or insulin resistance. Nor is it associated with the genetic inheritance of type 1 diabetes. Maturity-onset diabetes of the young accounts for 2 to 5 percent of type 2 diabetes.⁴

Gestational diabetes develops in 2 to 5 percent of all pregnancies, but disappears when the pregnancy is over. Gestational diabetes occurs more frequently in women from high-risk racial and ethnic groups and those with a family history of diabetes. Obesity is also associated with higher risk of this type of diabetes. Women who have had gestational diabetes are at risk for later developing type 2 diabetes. In some studies, nearly 40 percent of women with a history of gestational diabetes developed diabetes later in life.²

Other uncommon types of diabetes result from specific genetic syndromes, surgery, medications, malnutrition, infections and other illnesses. Such types of diabetes account for 1 to 2 percent of all diagnosed cases of diabetes.¹

SCOPE OF THE PROBLEM: DIABETES IN ALASKA

Prevalence of Diabetes

Approximately 14,000 Alaska adults have been diagnosed with diabetes, comprising 3.3% of the adult population. Among women, 3.8% have diabetes and among men, 2.9%. About 11% of the Alaska population over 65, or approximately 3,600 individuals, have diabetes.⁵ The highest prevalence of diabetes is found among African-Americans (4.6%) and Hispanics (4.4%) (Table 1).

Table 1: Prevalence of Diabetes in Alaska by Race/Ethnicity*

Race/ Ethnicity	Percent of adults who report a diagnosis of diabetes
White	3.3
African-American	4.6
Alaska Native	3.5
Asian/Pacific Islander	1.1
Hispanic**	4.4

*Alaska BRFSS 1991-1996

**Hispanic ethnicity can be of any race

The prevalence of diabetes among Alaska Natives is currently similar to that of Whites. However, diabetes has increased among Alaska Natives over the past decade as a shift has occurred from a traditional lifestyle to a more western lifestyle with accompanying increases in body weight and decreases in physical activity (Table 2).^{6,7} The vast majority (97%) of Alaska Natives with diabetes have type 2 diabetes.⁶ The prevalence of diabetes among Alaska Natives continues to increase at a higher rate than that of the U.S. as a whole.⁸

Table 2: Diabetes Prevalence among Alaska Natives: 1985 and 1993⁵

Alaska Native Group	Diabetes Prevalence 1985: percent*	Diabetes Prevalence 1993: percent*
All Alaska Natives	1.6	1.9
Eskimos	0.9	1.2
Indians	2.2	2.4
Aleuts	2.7	3.3

*Age-adjusted to 1980 U.S. population

The highest prevalence of diabetes in Alaska is in the Urban and Southeast Regions (Table 3). The higher prevalence in these regions may be the result of people with chronic diseases, such as diabetes, moving to areas with better access to health care.

Table 3: Diabetes Prevalence in Alaska by Region*

Region	Adults who report a diagnosis of diabetes: percent*
Urban	3.6
Gulf Coast	2.2
Southeast	3.6
Bush	2.0

*Alaska BRFSS 1993-97

Deaths from Diabetes

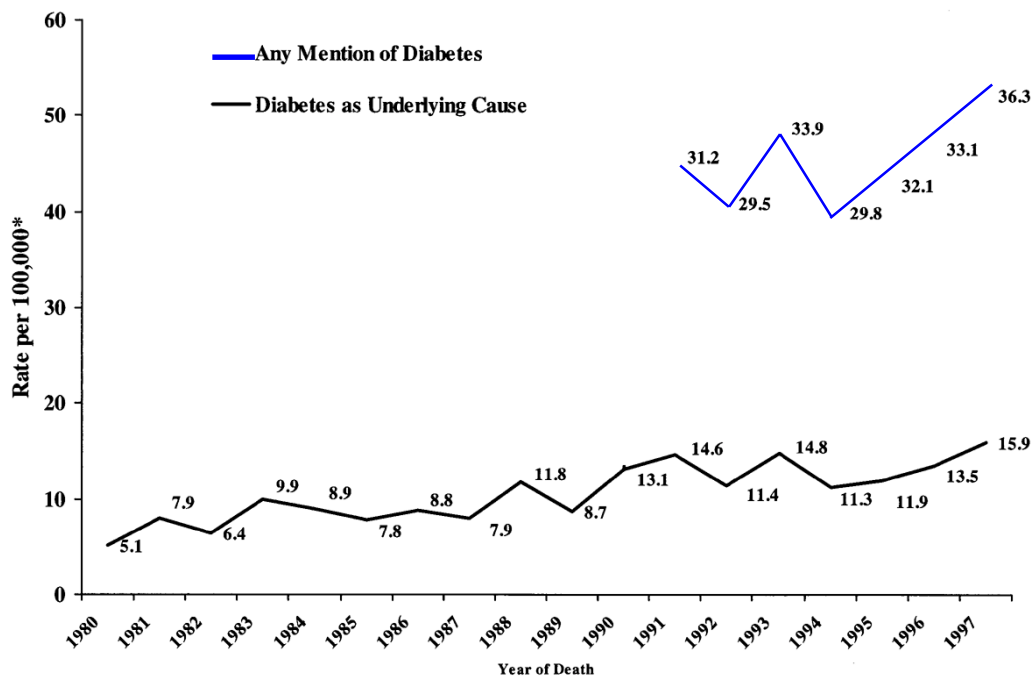
In 1997, diabetes was listed as the underlying cause of death for 79 Alaskans, making diabetes the 7th leading cause of death in Alaska. Diabetes was listed as any cause of death for 182 Alaskans in 1997.⁹

Diabetes is under reported on death certificates; studies have shown that among people with diabetes who die, diabetes will not be listed on as many as 60% of the death certificates. Furthermore, it is often

hard to determine if and how diabetes was related to the person's death. In addition, apparent changes can occur in diabetes mortality through simple reporting changes, such as adding an additional line to death certificates.¹⁰

Alaska's trend data for deaths from diabetes show a steady increase for diabetes as the underlying cause of death. However, as described above, it is difficult to know if the death rate is actually increasing, or if reporting has improved.

Figure 1: Mortality Rates for Diabetes* 1980-1997: Diabetes as the Underlying Cause of Death and Any Mention of Diabetes listed on Death Certificate



*Rates per 100,000 population, age-adjusted to U.S. 1940 population
ICD9 250.0 - 250.9

Complications of Diabetes

The U.S. Centers for Disease Control and Prevention (CDC) estimates that among people with diabetes in Alaska, there are annually 70 lower extremity amputations, 17 new cases of end-stage renal disease, 20-60 new cases of blindness, and 3980 hospitalizations, of which 1074 were due to cardiovascular disease.¹¹

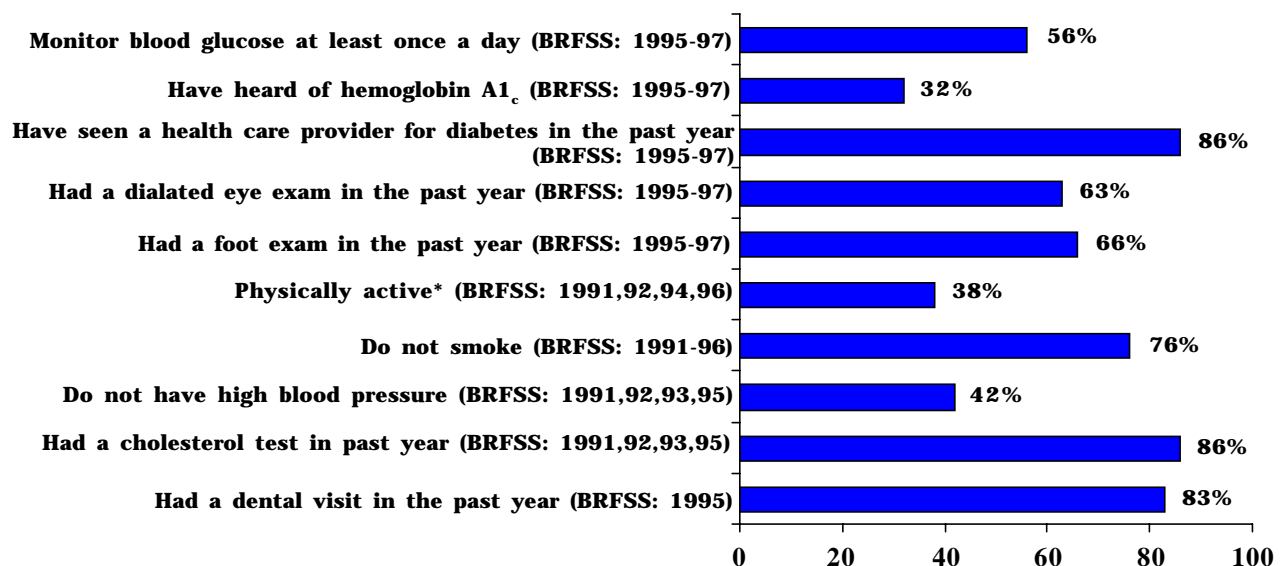
Risk Factors for Complications of Diabetes

For both type 1 and type 2 diabetes, studies have clearly shown that many diabetic complications can be prevented or delayed through improved glycemic control.^{12,13} Regular medical visits are also important to find and treat complications, such as retinopathy and foot problems, early. The increased cardiovascular risk from

diabetes can be reduced by healthy lifestyles, including not smoking and participating in moderate physical activity, and by screening for and treating hypertension and elevated cholesterol.

As seen in Figure 2, only 56% of Alaskans with diabetes monitored their blood sugar at least daily and only 32% had heard of a hemoglobin A1c. Most people with diabetes had seen a health care provider for diabetes in the past year, a dentist in the past year, and had a cholesterol test in the past 5 years. However, only 63% of people with diabetes had a dilated eye exam in the past year, and 66% had a foot exam. Only 38% of Alaskans with diabetes exercise regularly, and over half had high blood pressure. Smoking is especially detrimental to people with diabetes; 24% of Alaskans with diabetes are current smokers.

Figure 2: Prevalence of Factors Related to Preventing Diabetes Complications Among People with Diabetes in Alaska



Costs of Diabetes

The American Diabetes Association and the U.S. Centers for Disease Control estimated that, in 1997, the direct medical and indirect expenditures attributable to diabetes in the United States were \$98 billion.¹⁴ Direct medical expenditures were estimated at \$44.1 billion and indirect costs (lost productivity) were estimated at \$54 billion. These are the excess costs directly related to diabetes and exclude costs that would have occurred with or without diabetes. Total medical expenditures for people with diabetes was estimated at \$77.7 billion, or \$10,071 per capita, as compared to \$2,669 per capita for people without diabetes.

Similar studies have not been done in Alaska. However, applying these estimates to the number of people with diabetes in Alaska results in the following annual estimates:

- Direct medical costs attributable to diabetes in Alaska:
\$82 million
- Indirect expenditures attributable to diabetes in Alaska:
\$100 million
- Total direct medical expenditures for people with diabetes in Alaska:
\$141 million

These numbers are likely underestimates because the costs of medical care in Alaska are higher than the average national costs.

OPPORTUNITIES FOR PREVENTION

The increasing burden of diabetes and its complications is alarming. Most of the morbidity and mortality of diabetes is due to the complications associated with the disease, including blindness, kidney failure, nerve damage and cardiovascular disease. The good news is that much of the burden of diabetes can be prevented by improved delivery of care, and better education for diabetes self-management.³

In addition, evidence is accumulating that type 2 diabetes can be prevented or delayed through physical activity and weight management.^{15,16} Clinical trials are underway to determine if type 2 diabetes can be prevented.

Prevention of Diabetes Complications

Results from a recent study in the United Kingdom indicate that intensive treatment to control glucose levels in people with type 2 diabetes significantly reduces the risk of complications compared to conventional therapy. Similarly, a national 10-year study of people with type 1 diabetes in the U.S., the Diabetes Control and Complication Trial, confirmed that intensive therapy to control blood glucose levels can significantly prevent the onset or delay the progression of eye, kidney, and nerve damage.^{12,13}

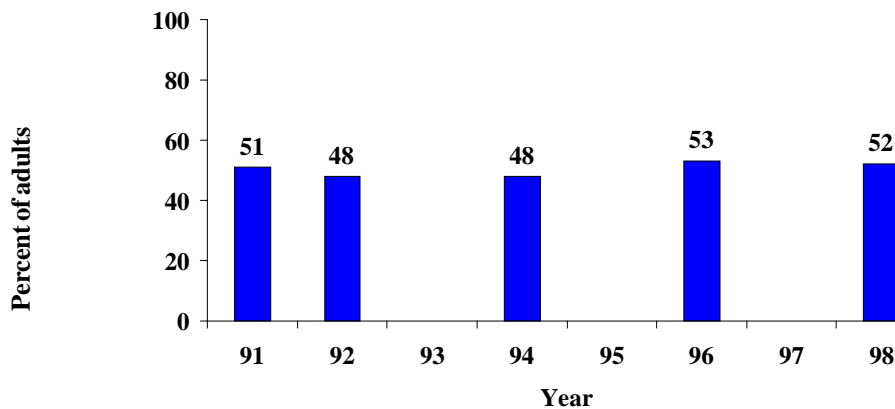
Physical Activity

The adoption and maintenance of a physically active lifestyle is essential for a healthy life. Regular physical activity protects against heart disease, high blood pressure, cancer, diabetes, depression and anxiety. Increasing evidence suggests that moderate physical activity that is less intense than vigorous can have significant health benefits, including a decreased risk of coronary heart

disease. For those that are inactive, even small increases in physical activity are associated with measurable health benefits.¹⁷

Among Alaskan adults, the majority have a sedentary lifestyle, and the trend is not encouraging (Figure 3).

Figure 3: Prevalence of Sedentary Lifestyle* Among Alaskan Adults 1991-1998



***Sedentary lifestyle=no leisure time activity, or activity less than 3 times per week for less than 20 minutes each.**

No data available for 1993, 1995, and 1997.

Data Source: Alaska BFRSS

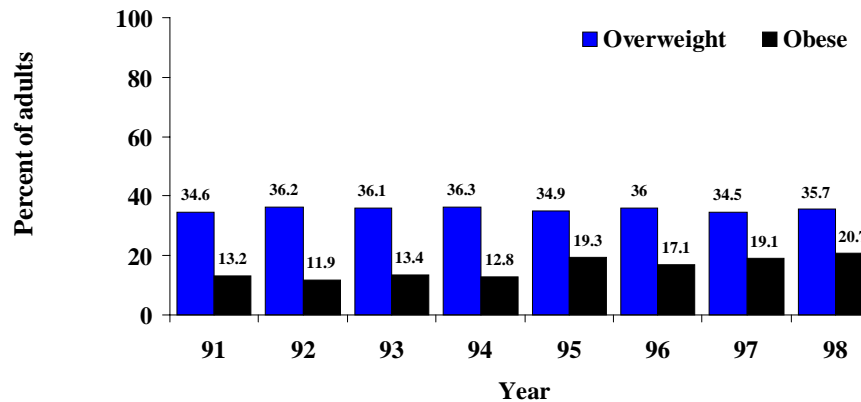
Overweight

There are multiple factors related to being overweight, including inherited, environmental, cultural, and socioeconomic conditions. Being overweight is associated with diabetes, elevated serum cholesterol levels and elevated blood pressure. The prevalence of overweight increases with advancing age until about age 50 for men and 70 for women then declines. Overweight is more prevalent in minority populations, especially among minority women.

There are several measures of body fat. The most commonly used is the Body Mass Index (BMI) which describes relative weight for height and is significantly correlated with the amount of total body fat. BMI is calculated as weight in kilograms/height in meters² (kg/m²). The National Heart, Lung and Blood Institute has recently reclassified the measure of “overweight” as BMI of 25.0 – 29.9 kg/m², and obesity as a BMI of 30.0 kg/m².¹⁸

The prevalence of being obese among Alaskans increased by 57% in Alaska from 1991 to 1998 (Figure 4). Similar trends are found in the United States.

Figure 4: Prevalence of Overweight* and Obesity among Alaskan Adults 1991-1998



*Overweight=BMI 25 - 29.9 kg/m²

Obese= BMI greater than or equal to 30 kg/m²

Data Source-Alaska BRFSS

Goals and Objectives

HEALTH SYSTEMS APPROACHES

Goal 1: Promote essential diabetes control services in Alaska.

Strategy 1: Ensure the widespread application of state specific standards of care for the management of diabetes.

Recommendations

- Collaborate with public, private, volunteers, nonprofit and academic organizations to develop and promote state specific diabetes clinical practice guidelines.
- Develop and distribute tools that make it easier for practitioners to implement clinical practice guidelines.
- Provide training and services to support use of clinical practice guidelines.
- Monitor provider acceptance and adherence to diabetes clinical practice guidelines.
- Develop and distribute tools for people with diabetes that make it easier to follow recommended standards of care for diabetes management.

Strategy 2: Promote access to quality services, equipment, and supplies necessary to maintain optimal glycemic control.

Recommendations

- Expand third party reimbursement for diabetes supplies and out patient diabetes education.
- Establish a policy group to examine existing policies or practices and identify barriers to access.
- Support national/state legislation to ensure Alaskans with diabetes have access to third party reimbursement for outpatient education, supplies, and equipment necessary to maintain glycemic control.
- Publish and distribute a resource directory, which includes resources appropriate for diverse cultures and languages.
- Educate legislators, policy makers, business leaders, and others about the value of preventive services for all persons with diabetes.

Comprehensive preventive practices, including diagnostic screening and clinical care to reduce the complications of diabetes, should be part of routine health care for all persons with diabetes. Much of the health and economic costs of diabetes-related complications can be averted through known prevention and treatment measures. A major goal of diabetes treatment is to maintain blood glucose near normal levels at all times.

Goal 2: Improve the effectiveness of public diabetes services through statewide planning and coordination.

Strategy 1: Promote greater cooperation between public and private agencies providing diabetes services in Alaska.

Recommendations

- Coordinate with, build, and strengthen coalitions working on issues related to diabetes prevention and control including but not limited to:
 - Eat Smart Alaska/Five A Day for Better Health
 - Alaska Tobacco Control Alliance
 - American Diabetes Association
 - Take Heart Alaska
 - Alaska Association of Diabetes Educators
- Increase awareness, support, and funding for statewide diabetes prevention and control activities.
 - Promote program flexibility to integrate diabetes prevention and control activities into statewide programs.
 - Promote increased program evaluation to study the effectiveness of statewide diabetes activities.

Improve coordination, advocacy and leadership in the prevention and control of diabetes. Although there is strong interest in diabetes control, many activities are done in isolation.

HEALTH COMMUNICATIONS: DIABETES AWARENESS AND EDUCATION

Public Awareness and Education

Goal 1: Promote increased awareness and understanding of diabetes.

Strategy 1: Raise awareness about healthy lifestyles, risk factors for diabetes and the need for regular preventive health care visits.

Recommendations

- Conduct a statewide education campaign on diabetes risks, healthy lifestyles and the need for regular preventive services.
 - Link with national diabetes media campaigns, i.e., National Diabetes Education Program, American Diabetes Association, American Association of Diabetes Educators, and Indian Health Service.
- Promote and disseminate information about populations at risk, diabetes risk factors and symptoms.
- Translate new research finding on diabetes treatment, prevention and issues specific to special populations into materials that are culturally sensitive.
- Develop/adopt patient education information on impaired glucose tolerance and risk for developing type 2 diabetes.

Strategy 2: Promote diabetes patient education.

Recommendations

- Work with health care agencies and providers to develop the infrastructure of a comprehensive clinical treatment and education center (Center of Excellence/ADA Recognized) through assessment of existing programs and review of other model diabetes education centers.
- Promote access to high quality diabetes patient education programs, including those programs that emphasize nutrition management and control of hypertension and other risk factors for diabetes complications.
- Assure accuracy of diabetes educational materials.
- Work with allied health professional schools to emphasize the importance of prevention and control of diabetes and its complications.
- Work with the American Diabetes Association, Juvenile Diabetes Foundation, American Association of Diabetes Educators, and other professional organizations in promoting quality diabetes education.

Raising public awareness with targeted messages about the seriousness of diabetes and risk factors for diabetes is essential for ensuring persons with diabetes have access to care and avoid long-term and costly complications.

Goal 2: Promote early screening and diagnosis of diabetes.

Strategy 1: Increase access of high-risk groups to screening.

Recommendations

- Conduct a statewide media campaign on early detection and screening for diabetes in adults age 45 and older and individuals in high-risk populations.
- Promote the use of the American Diabetes Association risk factor test “Take the Test, Know Your Score” for use in the general population.
- Work with health care providers and community organizations that serve high-risk populations to facilitate diabetes screening in communities.
- Conduct educational campaigns on diabetes risk factors targeted to high-risk populations.

The early detection of diabetes is critical to preventing and delaying the onset of diabetes complications. The American Diabetes Association has recently released new recommendations of diabetes screening. This includes screening all adults age 45 and older, and if normal, to be repeated at three year intervals. For those at high risk, testing should be considered at a younger age and more frequently.

Professional Awareness and Education

Goal 1: Improve health care providers' understanding of diabetes and its control and promote an integrated approach to care.

Strategy 1: Increase awareness of the seriousness of diabetes, the importance of blood glucose control, patient education, and patient support using a team approach.

Recommendations

- Identify and disseminate materials and tools such as train-the-trainer programs and interactive computer programs for clinical and academic settings.
- Encourage provision of continuing education units/continuing medical education for health care provider education offerings.
- Provide current diabetes information to health care providers, employers, and school officials/teachers.
- Promote the use of distance learning technologies to promote diabetes information update.
- Develop/adopt information on impaired glucose tolerance and its' relationship to diabetes for health care providers.

While early detection and treatment are key to long-term reductions in the health consequences of diabetes, proper treatment and self-management of the disease are also critical to preventing complications. Firm scientific data have recently confirmed that complications can be significantly reduced by improved diabetes control.

Health care providers and people with diagnosed diabetes need additional education on the latest in treatment, care and self-management of diabetes. The approach that will reach the largest number of people with diabetes and have the greatest impact on reducing costs involves working with health care systems to adopt state-of-the-art diabetes education and treatment practices.

Goal 2: Promote diabetes self-care.

Strategy 1: Enhance the availability of accurate and timely diabetes information, materials, and programs that emphasize diabetes self-care.

Recommendations

- Develop diabetes self-care guidelines consistent with American Diabetes Association Clinical Practice Guidelines for people with diabetes.
- Support the development and/or distribution of culturally appropriate diabetes information.
- Develop/adopt and widely distribute tools that assist people with diabetes and their families to follow diabetes self-care guidelines.
- Develop diabetes web site with Alaska specific information.
- Encourage and support the development of information resource centers at medical and public health facilities.

Health education is important to assure that individuals have the information and skills they need to protect and enhance their own health, the health of families for which they are responsible, and the health of the communities in which they live.

COMMUNITY-BASED PROGRAMS

Goal 1: Develop, support, and implement community-based approaches aimed at changing behaviors, policies, and environments.

Strategy 1: Enhance partnerships by involving community members in the planning, developing, and implementing of community-based programs.

Recommendations

- Continue to collaborate with local resources in communities to address diabetes issues at the local level.
- Work with communities that serve high-risk minority, low income and rural populations to reduce cultural, economic and geographic barriers to diabetes services.
- Involve the Alaska Health Fairs in diabetes education activities.

Community-based interventions and programs attempt to reach and improve the health of many people outside of the health care setting. Whereas a community-based intervention is a single action or activity initiated for the purpose of encouraging or supporting change, a community-based program is a planned, coordinated, ongoing effort that characteristically includes multiple interventions. Community-based programs recognize the importance of addressing the social and physical environment in which behavior occurs.

Goal 2: Reduce the prevalence of the modifiable risk factors of obesity, sedentary lifestyle, and tobacco use.

Strategy 1: Improve the ability of all Alaskans to make the necessary lifestyle changes to obtain sufficient physical activity.

Recommendations

- Encourage innovative use of space for physical activity.
- Increase access to facilities for year-round physical activities.
- Increase access to physical activity for low-income youth and families.
- Improve sidewalks, ski trails, hiking trails, and bike paths to ensure safe, accessible opportunities for physical activity.
- Increase frequency of community-wide events that provide opportunities for fun, “family friendly” physical activity.
- Create and expand after school physical activity programs.
- Work with parks and recreation to improve playgrounds and play areas in communities.
- Promote and involve worksite wellness programs in planning and implementing wellness programs, which allow employees the opportunities to incorporate physical activity into their daily lives.
- Support comprehensive school health programs.

Strategy 2: Improve the ability of all Alaskans to make the necessary lifestyle changes to eat a healthy diet.

Recommendations

- Encourage public and private facilities to offer nutritious snacks (high fiber, low fat) in vending machines.
- Encourage availability of healthy foods in restaurants and fast food establishments.
- Work with grocery stores to make available affordable healthy food choices.
- Enhance the availability of nutrition education services provided by registered dietitians within communities.
- Work with organizations that represent minority groups to develop culturally specific programs for promoting proper nutrition.
- Work with food banks and other organizations that provide meals to low-income and seniors to provide and promote healthy food choices.
- Support comprehensive school health programs.

Strategy 3: Improve the ability of all Alaskans to make the necessary lifestyle changes to live tobacco free.

Recommendations

- Promote smoke-free businesses and restaurants.
- Support and increase access to smoking cessation programs within communities.
- Enforce existing laws on youth access to tobacco.
- Support smoke-free campaigns.
- Support comprehensive school health programs.

Behaviors are largely influenced by beliefs and attitudes, which are greatly affected by community and cultural traditions. The most effective community-based programs recognize the interrelationship between behavior and the environment and include multiple interventions directed at multiple levels.

DIABETES SURVEILLANCE

Goal: Improve Alaska's capability of obtaining data about diabetes, including diabetes complications, self-management and health care provider practices, so that the information can be used for developing and evaluating interventions to improve the health of people with diabetes.

Strategy 1: Increase capacity to use existing data systems.

Recommendations

- Support and make use of data from the existing data systems.
 - Increase use of Medicaid and Medicare data.
 - Increase use of data from the Alaska Area Wide Diabetes Program.
 - Support the Behavioral Risk Factor Surveillance System.

Strategy 2: Advocate for additional data collection systems necessary for evaluating the impact of diabetes in Alaska.

Recommendations

- Support implementation of a statewide uniform hospital discharge data system.
- Develop/implement a statewide system of surveillance to monitor the incidence and prevalence of diabetes complications.

Strategy 3: Conduct special studies to improve knowledge about diabetes in Alaska.

Recommendations

- Implement knowledge, attitude and practice surveys among health care providers regarding diabetes management.
- Implement surveys among people with diabetes to evaluate diabetes self-care practices.

Public health surveillance is the ongoing systematic collection, analysis and interpretation of outcome-specific data for use in the planning, implementing and evaluating of public health practice. Reliable data on prevalence, morbidity and mortality, health behaviors and preventive practices related to diabetes are essential for assessing the impact of diabetes on the health of Alaskans and determining health policies and practices.

References

1. Harris M.I., (1995) Diagnosis criteria, and screening for diabetes. In: Diabetes in America. (National Institutes of Health Publication no. 95-1468) pg. 15-39 Bethesda: MD.
2. American Diabetes Association (1999). Clinical practice guidelines. Diabetes Care, **22**, Suppl 1 S1-S114.
3. U.S. Department of Health and Human Services (1999). Diabetes: a serious public health problem. (CDC publication). Atlanta: GA
4. Cabanas, E.A., (1998). Maturity-onset diabetes of the young: recent findings indicate insulin resistance/obesity are not factors. The Diabetes Educator, **24**, 477-480.
5. Alaska Behavioral Risk Factor Surveillance System (1990-1996). Alaska Division of Public Health, Section of Community Health and Emergency Medical Services, unpublished data.
6. Schraer C.D., Adler A.I., and Mayer A.M., et al. (1997). Diabetes complications and mortality among Alaska Natives: 8 years of observation. Diabetes Care **20**, 314-321.
7. Gohdes D. (1995). Diabetes in North American Indians and Alaska Natives. Diabetes in America, (NIH, publication No. 95-1468) pg. 683-702. Bethesda: MD.
8. Alaska Native Medical Center Diabetes Program (1999). Alaska Native Medical Center Diabetes Registry, Unpublished data.
9. Alaska Bureau of Vital Statistics (1997). Annual Report, Alaska Division of Public Health.
10. Geiss L.S., Herman W.H., and Smith P.J. (1995). Mortality in non-insulin dependent diabetes. Diabetes in Alaska, (NIH, publication No. 95-1468) pg. 233-258. Bethesda: MD.
11. Centers for Disease Control and Prevention: (1994). Diabetes in the United States: A strategy for prevention.
12. Diabetes Control and Complications Trial Research Group (1993). The effect of intensive treatment of diabetes on the development and progression of long-term complications in insulin-dependent diabetes mellitus. New England Journal of Medicine **329**, 977-986.
13. UK Prospective Diabetes Study Group (1998). Intensive blood glucose control with sulfonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes. Lancet **352**, 837-853.
14. American Diabetes Association (1998). Economic consequences of diabetes mellitus in the U.S. in 1997. Diabetes Care **21**, 296-309.
15. Wylie-Rosett, J. (1998): Efficiency of diet and exercise in reducing body weight and conversion to overt diabetes. Diabetes Care **21**, 334.
16. Bennett, P.H., (1997): Primary prevention of NIDDM: a practical reality. Diabetes Metab Rev **13**, 105-111.

References

17. U.S. Department of Health and Human Services (1996). Physical activity and health: A report of the surgeon general. USDHHS, CDC, The President's Council on Fitness and Sports.
18. National Heart, Lung and Blood Institute (1988). Clinical Guidelines on the identification, evaluation and treatment of overweight and obesity in adults, the evidence report. NIH, NHLBI.

**STATE OF ALASKA
RECOMMENDATIONS FOR THE MANAGEMENT
OF DIABETES IN ADULTS**

The Recommendations for the Management of Diabetes in Adults were developed by the Health Systems Sub-committee of the Alaska Diabetes Coalition as a strategy to ensure the widespread application of accepted clinical practice recommendations. The Recommendations for Management of Diabetes in Adults, adapted from the 1999 American Diabetes Association Clinical Practice Recommendations, provide typical courses of intervention for the management of diabetes and are not fixed protocols. The individual management of diabetes should be determined by the health care provider and be based on the needs of the individual with diabetes.

State of Alaska

Recommendations for Management of Diabetes in Adults

Therapeutic Goals (for non-pregnant adults)*

	Goal	Action Suggested†
Fasting/preprandial glucose	80-120 mg/dl	<80 or >140 mg/dl
Bedtime glucose	100 to 140 mg/dl	<100 or >160 mg/dl
Hemoglobin A1c‡	<7% (or 1% above lab normal)	>8%
Urine microalbumin	<30 mg/day	>30 mg/day

†Depends on individual patient circumstances

‡Reference to a nondiabetic range of 4% to 6% (mean 5%, SD 0.5%)

*Ref: American Diabetes Association: Clinical Practice Recommendations, 1999

Blood Pressure and Lipid Goals

Systolic	<130 mm Hg	Cholesterol	<200 mg/dl
Diastolic	<85 mm Hg	LDL-C	<100 (mg/dl)
		HDL-C	>35 mg/dl in men >45 mg/dl in women
		Triglycerides	<200 mg/dl

Initial Visit

Complete history and physical with special emphasis on cardiovascular, neurologic and integumentary systems, oral exam, thyroid palpation, and comprehensive lower extremity evaluation-check protective sensation with 10 gram monofilament.

Each Clinic Visit

- | | |
|--------------------|--|
| ✓ Blood pressure | ✓ Blood glucose |
| ✓ Weight | ✓ Determine if HbA1c is needed |
| ✓ Visual foot exam | ✓ Discuss all blood glucose results (FBS, HbA1c, SMBG records) |

Routine Laboratory Tests

(frequency of repeat tests is dictated by results and/or treatment goals)

Tests	Frequency
Fasting plasma glucose	Initial-optional, yearly
HbA _{1c}	Quarterly (if treatment changes or goals not met)
Fasting lipid profile	Initial, quarterly (if treatment changes or goals not met)
Liver functions test	Frequency dictated by results or treatment with thiazolidinediones
Serum creatinine	Initial, yearly (if proteinuria present)
Thyroid function	Initial-if indicated
Chemistry (including electrolytes)	Initial
Microalbumina	Initial

Routine Health Maintenance

Tests and Exams	Frequency
Physical exam	Complete exam at initial visit, then yearly
Pap Smear/Pelvic exam	Yearly
Breast exam	Yearly
Mammogram	Every 1-2 years in women ages 40-49, yearly thereafter
Fecal occult blood	Yearly in adults ≥50 years of age
Flexible sigmoidoscopy	Every 5 years in adults ≥ 50 years of age
Tobacco use	Counsel to stop every visit
Comprehensive lower extremity exam (vascular, sensory, musculoskeletal)	Yearly
Dilated retinal exam	Yearly (ophthalmologist, optometrist)
Dental exam	Every 6 months
Immunizations	Frequency
Flu vaccine	Yearly
Pneumococcal vaccine	Every 6 years
dT	Every 10 years
Hepatitis B	Persons whose renal disease is likely to lead to dialysis or transplantation (serum creatinine ≥2.0)

Aspirin Therapy

- Consider aspirin therapy as a primary prevention of CHD for all adults with diabetes.
- Enteric coated aspirin dose of 81-325 mg/day is recommended.

Patient Education for Self-Care Management

Nutrition education	Initially then as needed
General diabetes education	For all patients with diabetes and their families.
Exercise education	Should include appropriate type of activity, frequency, duration, and intensity, and be individualized for each patient.
Self-Monitoring Blood Glucose (SMBG)	Patients should learn how to do SMBG; frequency must be individualized. Patients and providers should use SMBG results to determine the pattern of BG throughout the day and use this pattern for selection and adjustments in therapy.

Screening for Diabetes in Pregnancy

- Measure blood glucose during first prenatal visit.
- Between the 24th and 28th weeks gestation perform screening test-50g oral glucose load followed by plasma glucose 1-hour later.
- If plasma glucose value ≥ 140 mg/dl perform full diagnostic test (100g 3-hour oral glucose tolerance test).
- If 50g oral glucose tolerance screening test was performed before 24th week gestation and was normal, repeat screening test between the 24th and 28th week gestation.

Gestational diabetes-Post-partum follow-up

Screen for diabetes (plasma glucose test) at least 6 weeks post-partum and if normal repeat screening every 1-3 years depending on risk factors.

Special Tests

Graded exercise tolerance test with electrocardiogram

Frequency

Before beginning exercise program in*

- 1) Individuals with known or suspected CHD
- 2) Asymptomatic individuals who
 - have Type 1 diabetes for >15 years, or
 - have Type 1 diabetes and are >30 years old, or
 - have Type 2 diabetes and are >35 years old

*Have a high index of suspicion for heart disease in people with diabetes.

Special Consideration – Abnormal Findings

Foot Abnormalities

Loss of protective sensation
Vascular disease
Structural deformities
Skin or nail deformities

Recommendations

If any abnormalities detected the person should be seen by qualified health care professional who is experienced in diabetic foot care.

Diabetic Eye Disease

Macular edema
Severe nonproliferative
Diabetic retinopathy (NPDR)
Proliferative diabetic retinopathy (PDR)

Recommendations

Individuals with any level of macular edema, severe NPDR or PDR require prompt care of an ophthalmologist who is experienced in the management and treatment of diabetic retinopathy.

Protein in Urine

Microalbuminuria >30 mg/day
Clinical albuminuria >300 mg/day

Recommendations

- ACE inhibitor
- Hypertension control

CLASSIFICATION OF DIABETES

Type 1 diabetes

Type 1 diabetes is characterized by beta cell destruction, usually leading to absolute insulin deficiency. Type 1 diabetes has previously been called insulin-dependent diabetes, type I diabetes, and juvenile onset diabetes. The most common form, immune-mediated type 1 diabetes, results from autoimmune destruction of the β -cells of the pancreas. Immune-mediated type 1 diabetes most commonly occurs in childhood and adolescence, but can occur at any age. The rate of β -cell destruction can be variable, being rapid in some (children and adolescents) and slower in others (adults). A minority of patients with type 1 diabetes have idiopathic type 1 diabetes, in which patients have permanent insulinopenia and are prone to ketoacidosis, but have no evidence of autoimmunity.

Type 2 diabetes

Type 2 diabetes is characterized by insulin resistance and relative (rather than absolute) insulin deficiency. Although not dependent on exogenous insulin for survival, individuals with type 2 diabetes may require it for adequate control of hyperglycemia. Most patients with type 2 diabetes are overweight.

Gestational Diabetes Mellitus

Gestational diabetes mellitus is defined as glucose intolerance with onset or first recognition during pregnancy. This definition applies regardless of whether insulin or diet modification is used for treatment or whether the condition persists after pregnancy. It does not exclude the possibility that unrecognized glucose intolerance may have antedated or begun concomitantly with the pregnancy.

Impaired Glucose Tolerance/ Impaired Fasting Glucose

Impaired glucose tolerance (IGT), based on the oral glucose tolerance test and an analogous state called impaired fasting glucose (IFG), based on the fasting plasma glucose, refer to a metabolic state intermediate between normal glucose homeostasis and diabetes. Criteria for the diagnoses of IGT and IFG are found on page 31. Although not clinical entities in their own right (in the absence of pregnancy), they are risk factors for future diabetes and cardiovascular disease, thus making blood pressure and lipid management essential.

SCREENING FOR DIABETES

Type 1 diabetes

Screening healthy individuals for the presence of autoantibodies related to type 1 diabetes is not currently recommended. Reasons include: 1) clinically relevant cutoff values for the antibody levels have not been determined, and 2) there is no consensus as to what action should be taken if antibodies are found. At the present time, there are several clinical trials testing the efficacy and safety of therapies to prevent or delay the onset of type 1 diabetes among high risk individuals for example, siblings of type 1 patients. If the studies find an effective means of preventing type 1 diabetes, screening recommendations may change.

Type 2 diabetes

1. A fasting plasma glucose test should be considered in all individuals aged 45 years and older, and if normal, should be repeated at 3-year intervals.
2. A fasting plasma glucose test should be considered at a younger age or be carried out more frequently in individuals who have one or more of the following risk factors:

- Family history of diabetes (parent, sibling or child with diabetes);
- Obesity (defined as $\geq 20\%$ over desired body weight or BMI $\geq 30 \text{ kg/m}^2$);
- Member of a high-risk ethnic population (African-American, Hispanic-Americans, Native Americans, Asian Americans, Pacific Islanders);
- Previously identified as IGT or IFG;
- Hypertension ($\geq 140/90 \text{ mm/Hg}$);
- HDL cholesterol $\leq 35 \text{ mg/dl}$ and/or triglyceride level $\geq 250 \text{ mg/dl}$;
- History of gestational diabetes or infants weighing over 9 pounds at birth.

Screening Tests

The fasting plasma glucose test (FPG) and the oral glucose tolerance test are both suitable tests for diabetes. The FPG test is strongly preferred because it is easier and faster to perform, more convenient and acceptable to the patients and less expensive.

Criteria for Diagnosis of Diabetes and Impaired Glucose Tolerance/Impaired Fasting Glucose

Diagnosis Testing Procedure	Normoglycemia	Impaired Glucose Metabolism (IGT/IFG)	Diabetes*
Random Glucose			≥200mg/dl <u>plus</u> symptoms of diabetes OR
Fasting Plasma Glucose†	<110 mg/dl	≥110 and <126 mg/dl (IFG)	≥126 mg/dl OR
Oral Glucose Tolerance Test‡: 2-hour post glucose load	<140 mg/dl	≥140 and <200 mg/dl (IGT)	>200 mg/dl

*A diagnosis of diabetes must be confirmed on a subsequent day by measurement of random glucose (if symptoms are present), fasting plasma glucose or oral glucose tolerance test.

† Fasting is defined as no caloric intake for at least 8 hours.

‡ Requires the use of a glucose load containing the equivalent of 75 grams of anhydrous glucose dissolved in water.

HEMOGLOBIN A_{1c} (HbA_{1c})

Hemoglobin A_{1c}

Glycated hemoglobin, also known as glycohemoglobin, glycosylated hemoglobin, HbA_{1c} or HbA1, refers to a series of stable hemoglobin components formed by the combination of glucose and hemoglobin. Individuals with higher levels of blood glucose will have higher levels of glycated hemoglobin. Because the hemoglobin components are stable, the level provides an average indication of the overall blood glucose levels over the prior 2 to 3 month period. The most commonly used version of the glycated hemoglobin test is the HbA_{1c}.

Clinicians should be aware that any clinical situation which increases erythrocyte turnover and increases the percentage of young circulating erythrocytes, such as hemolytic anemia will lower the measured HbA_{1c} level. Other clinical situations that may interfere with the assay methodology include hemoglobinopathies, chronic alcohol ingestion, salicylates, uremia and sample storage effects. HbA_{1c} is not used for the diagnosis of diabetes, its role is in the evaluation of glucose control.

HbA_{1c} Assay

HbA_{1c} is a simple blood test that can be measured any time of the day without regard to food intake or glucose level. There are several different types of assays for glycated hemoglobin. Some assays measure HbA_{1c} directly; others measure total glycated hemoglobin and derive a calculated HbA_{1c} result. The range of normal varies between assay types. Practitioners should be aware of the specific assay used in their laboratory and the range of normal values.

Testing

HbA_{1c} should be tested at least every six months in all persons with diabetes. More frequent monitoring is appropriate if a person's diabetes is not in control, if there are significant changes in diabetes management, and in some people with type 1 diabetes.

HbA_{1c} Goal

The ideal goal for HbA_{1c} is <7%, or 1% above the upper limit of normal for testing laboratory. Practitioners should re-evaluate the treatment regimen for anyone with HbA_{1c} levels that are consistently >8%.

DIABETIC RETINOPATHY

Prevalence of Diabetic Retinopathy

After 20 years nearly all persons with type 1 diabetes and >60% of persons with type 2 diabetes have some degree of retinopathy. Up to 21% of persons with type 2 diabetes have retinopathy at the time of diagnosis.

Risk for Developing Retinopathy

Poor glycemic control, high blood pressure and proteinuria are all positively correlated with both the incidence and the rate of progression of retinopathy. Pregnancy, puberty, and cataract surgery can accelerate the progression of retinopathy.

Prevention and Reducing Progression of Diabetic Retinopathy

For both type 1 and type 2 diabetes, studies have clearly shown that retinopathy can be prevented or delayed, and that progression of retinopathy can be slowed, through improved glycemic control. The Diabetes Control and Complications Trial (DCCT) demonstrated an association in type 1 diabetes between glycemic control and the development of microvascular complications, including retinopathy, nephropathy and neuropathy.² Similar results were found for type 2 diabetes in the United Kingdom Prospective Diabetes Study.³

Retinal Screening Exams

Yearly dilated examination is the best approach to screening for diabetic retinopathy. Retinal examinations should be performed by an ophthalmologist or optometrist knowledgeable and experienced in the diagnosis and management of diabetic retinopathy.

Persons with type 1 diabetes should have an initial dilated retinal exam within 3 to 5 years after the onset of diabetes. Persons with type 2 diabetes should have an initial dilated retinal exam shortly after diagnosis and annually thereafter.

Pregnant women with pre-existing diabetes should be screened for diabetic retinopathy prior to conception and during the first trimester. Frequency of follow-up screening is individualized and dependent upon physician discretion and results of first trimester exam.

Referral to Retinal Specialist

All persons with any level of macular edema, moderate to severe nonproliferative retinopathy or any proliferative retinopathy require the prompt care of an ophthalmologist knowledgeable and experienced in the treatment of diabetic retinopathy. Referral to an ophthalmologist **should not** be delayed until proliferative diabetic retinopathy has developed.

FOOT CARE

Foot Care

In the presence of neuropathy or ischemia, minor foot trauma can lead to cutaneous ulceration and wound-healing failure, which frequently leads to amputation. Once an amputation has occurred, the prognosis for the contralateral limb is poor. Appropriate management can prevent and heal diabetic foot ulcers and greatly reduce amputations.

Risk Factors for Foot Ulcers and Amputations among People with Diabetes

- Diabetes for more than 10 years
- Male gender
- Poor glucose control
- Cardiovascular, retinal, neurologic or renal complications
- Structural deformities of the lower extremities
- Abnormal gait
- Skin or nail deformities
- History of previous ulcers or infections

High risk individuals should be seen at regular intervals by qualified health care professionals who are experienced in the care of diabetic foot problems.

Individuals are at low risk of developing foot ulcers if they have none of the above risk factors. Low risk individuals should receive instruction on basic preventive foot care and have routine foot inspections.

Visual Inspection

A qualified health care professional should visually inspect the legs and feet of individuals with diabetes **at every regular visit**. High risk individuals and family members should be instructed to perform daily foot inspections. All parts of the legs and feet should be examined including between the toes and back of the heel.

Comprehensive Foot Exam

A comprehensive foot exam should be done at least yearly, and more frequently for high risk individuals. The exam should include:

- Vascular evaluation including palpation of pulses in the feet and legs, inspection for ischemic changes of the skin.
- Neurologic exam of sensorimotor function using a 10 grams monofilament.
- Musculoskeletal exam including range of motion of foot and ankle and inspection for bony abnormalities.
- Check for abnormal gait or wear patterns on footwear.

Abnormal Exam

If vascular disease, sensorimotor deficiencies, musculoskeletal or gait abnormalities are present, a foot exam should be performed at each routine diabetes visit. Ongoing care by a qualified health care professional experienced in the care of diabetes foot problems should be initiated.

HYPERTENSION

Hypertension

Control of hypertension in persons with diabetes reduces the rate of progression of diabetic nephropathy and reduces complications of hypertensive nephropathy, cerebrovascular and cardiovascular disease.

In type 1 diabetes, persistent hypertension can be a manifestation of diabetic nephropathy. In type 2 diabetes, hypertension is often part of a syndrome, which includes glucose intolerance, insulin resistance, obesity, dyslipidemia, and susceptibility to coronary artery disease.

Goals of Therapy

The primary goal of therapy for non-pregnant adults ≥ 18 years of age is to decrease blood pressure to, and maintain it at, <130 systolic and <85 diastolic.

Nonpharmacologic Therapy

Lifestyle modifications can be definitive treatment or adjuncts to pharmacologic therapy. Effective lifestyle modifications include weight management, increased physical activity, smoking cessation, reduction of dietary sodium and limits on alcohol consumption. In addition to improving diabetes and hypertension control, these lifestyle modifications also reduce other cardiovascular risk factors.

Pharmacologic Therapy

If lifestyle modifications do not achieve the desired goal, medications should be added in a stepwise manner until the goals are achieved.

Angiotensin-Converting Enzyme (ACE) Inhibitors

ACE inhibitors have been demonstrated to reduce microalbuminuria and proteinuria and to delay or retard the development of diabetic nephropathy among normotensive and hypertensive patient with diabetes. ACE inhibitors have no adverse effects on lipid levels or glycemic control and can improve insulin sensitivity. ACE inhibitors are contraindicated in pregnancy, and therefore should be used with caution among women of childbearing age. Hyperkalemia can develop among patients with advanced renal insufficiency, hyporeninemic hypoaldosteronism and those taking potassium-sparing drugs and supplements. A rapid decline in renal function can occur in patients with bilateral renal artery stenosis or advanced renal disease. Cough, and rarely, angioedema, can also occur.

Other Medications

If treatment goals are not met with lifestyle modifications and ACE inhibitor (or if ACE inhibitor is contraindicated), additional medications can be added in a stepwise manner until the goals are reached. Medications that may have an advantage in diabetes include angiotension receptor blockers, α -1-receptor blockers, calcium antagonists and thiazide diuretics in small doses. Agents that should be used with caution include β -blockers, centrally acting α -agonists, potassium-sparing agents and sympatholytic agents. For a more detailed discussion of diabetes and hypertension, see the consensus statement.⁴

Isolated Systolic Blood Pressure in Diabetes

Isolated systolic hypertension may occur in both type 1 and type 2 diabetes and is due, in part, to inelasticity of atherosclerotic large vessels. For patients with isolated systolic blood pressure of >180 mm Hg, the goal is a blood pressure <160 mm Hg. For patients with systolic pressure between 160 and 179 mm Hg, the goal is a 20 mm Hg reduction. Further lowering may be appropriate if the initial reduction is tolerated.

PREVENTION OF DIABETIC NEPHROPATHY

Diabetic Nephropathy

The first clinical evidence of diabetic nephropathy is the appearance of low but abnormal amounts of albumin in the urine referred to as microalbuminuria. Patients with microalbuminuria are likely to progress to clinical albuminuria. Once clinical albuminuria occurs, the risk for end stage renal disease is high in type 1 diabetes and significant in type 2 diabetes. Important interventions that can prevent diabetic nephropathy or significantly delay its progression include glycemic control, hypertension control and use of angiotensin-converting enzyme (ACE) inhibitors.

Screening

All diabetic patients who are older than 12 years should have their urine tested for albumin excretion at least once a year. If **positive** for protein, a quantitative measure (24-hour urine or overnight collection) is helpful. If **negative** for protein, a test for the presence of microalbuminuria is necessary.

Screening Tests for Microalbuminuria

Three screening methods are available:

1. Albumin/creatinine ratio in a random spot collection
2. 24-hour urine collection for protein and creatinine
3. Time collection (four hours or overnight)

The first method, the albumin/creatinine ratio is usually the easiest in the office setting. First void or morning samples are preferred, but if this is not possible, all samples for a given individual should be collected at the same time of the day to minimize the effect of normal diurnal variation in albumin excretion.

Screening with reagent tablets or dipsticks specific for microalbuminuria can be useful but all positive tests by reagent tablets or dipstick should be confirmed by more specific methods. Because there is day to day variability in albumin excretion, at least two of three collections done in a three to six month period should show elevated levels before the diagnosis of microalbuminuria is made.

Criteria for Diagnosis of Microalbuminuria Using the Albumin/Creatinine Ratio in a Random Spot Collection

- Normal
<30 mg/gm
- Microalbuminuria
30-300 mg/gm
- Clinical albuminuria
>300 mg/gm

Interventions to Prevent/Delay Diabetic Nephropathy

Glycemic Control

Intensive diabetes management with the goal of achieving near normoglycemia has been proven to delay the onset of microalbuminuria and the progression of microalbuminuria to clinical albuminuria, among patients with type 1 diabetes. Recently, similar results were found for patients with type 2 diabetes.

Blood Pressure Control

Lowering blood pressure to <130/85 by any effective means, should be the goal among all individuals with hypertension and diabetes. Decreasing the blood pressure will decrease the rate of progression of diabetic nephropathy.

Angiotensin-Converting Enzyme (ACE) Inhibitor

Among hypertensive patients with either type 1 or type 2 diabetes and microalbuminuria, treatment with ACE inhibitors has been shown to delay progression from microalbuminuria to clinical albuminuria. ACE inhibitors have also been shown to slow the decline in renal function among patients with clinical albuminuria. **The use of ACE inhibitors is recommended for all type 1 patients with microalbuminuria, whether hypertensive or not.** The use of ACE inhibitors among normotensive type 2 patients is not as well substantiated. Among type 2 patients without hypertension, a progression of albuminuria or the development of hypertension would be indications for ACE inhibitors.

MANAGEMENT OF DYSYLIPIDEMIA

Dyslipidemia

Diabetes increases the risk for atherosclerotic vascular disease. The risk is greatest among patients with diabetes who have other risk factors, such as dyslipidemia, hypertension, smoking and obesity. It is important to identify and manage all modifiable cardiovascular risk factors among patients with diabetes, including lipid abnormalities.

The most common abnormalities found in type 2 patients are elevated triglyceride levels and low HDL levels. The concentration of LDL cholesterol in type 2 patients is not significantly different from non-diabetic patients. However, because of the increased risk for atherosclerotic vascular disease among patients with diabetes, the desired LDL levels is lower (see below).

Diagnostic Testing

Adults with diabetes should be evaluated annually. Testing should include:

- Fasting total cholesterol
- Fasting triglyceride
- HDL cholesterol
- Calculated LDL cholesterol

If the lipid profile is abnormal, consideration should be given to correctable secondary causes such as hypothyroidism, poor glycemic control, medications, renal disease, estrogen replacement therapy, and alcohol consumption.

Goals of Treatment

The primary goal of therapy among patients with diabetes is to lower the LDL cholesterol to ≤ 100 mg/dl. Patients who have triglycerides levels ≥ 1000 mg/dl are at risk of pancreatitis and need special, immediate attention to lower triglycerides to ≤ 400 mg/dl. Glycemic control should be the first intervention; patients should avoid alcohol, and a fibric acid derivative (gemfibrozil) may also be needed.

Priorities for Management

In general, all people with diabetes who have lipid abnormalities should have a trial of nutrition therapy, exercise, and optimization of glycemic control.

The main priority is to lower the LDL cholesterol; if medications are indicated, the first choice is an HMG CoA reductase inhibitor. The next priority is to raise the HDL; behavioral interventions such as weight loss, exercise and smoking cessation are most effective. The next priority is to lower the triglycerides (unless at a dangerously high level; see above); glycemic control is the first intervention, followed by a fibric acid derivative (gemfibrozil).

MEDICAL NUTRITION THERAPY

Medical Nutrition Therapy

There is no one “diabetic diet” or “ADA diet.” Medical nutrition therapy (MNT) for people with diabetes should be individualized, with consideration given to usual eating habits and other lifestyle factors. Monitoring metabolic parameters including blood glucose levels, glycated hemoglobin, lipids, blood pressure, body weight, and renal function, as well as quality of life is crucial to ensure successful outcomes. It is essential that ongoing nutrition self-management education and care be provided for individuals with diabetes. A coordinated team of professionals working with the person with diabetes is required to achieve nutrition goals. A registered dietitian knowledgeable and skilled in implementing diabetes medical nutrition therapy should be a member of the management team and assume primary responsibility for nutrition care and education. Ideally, patients should have an initial visit with a dietitian, and then ongoing follow up every 6 months to a year.⁵

Goals of Medical Nutrition Therapy

1. Maintenance of as near normal blood glucose levels as possible by balancing food intake with insulin or oral glucose-lowering medications and physical activity.
2. Achievement of optimal serum lipid levels.
3. Provision of adequate calories for maintaining weight, normal growth and development in children and adolescents, increased metabolic needs during pregnancy and lactation, or recovery from catabolic illnesses.
4. Prevention and treatment of the acute complications of insulin treated diabetes such as hypoglycemia, short-term illness and exercise related problems.
5. Prevention and treatment of long term complications of diabetes such as renal disease, neuropathy, retinopathy, hypertension and cardiovascular disease.
6. Improvement of overall health through optimal nutrition.

SELF MONITORING OF BLOOD GLUCOSE

Self-Monitoring of Blood Glucose

Monitoring glycemic status is considered the cornerstone of diabetes care. Patients with diabetes can use self-monitoring of blood glucose (SMBG) to monitor their efforts to achieve and maintain specific glycemic goals. Results of SMBG are used to assess the efficacy of therapy and to guide adjustments in Medical Nutrition Therapy (MNT), exercise, and medications. SMBG is recommended for all insulin-treated patients; in addition, SMBG may be desirable in patients treated with oral agents and in patients not reaching glycemic goals.

Frequency of Self-Monitoring of Blood Glucose

Type 1 diabetes

Frequency and timing of glucose monitoring should be dictated by the needs and goals of the individual with type 1 diabetes. For most individuals with type 1 diabetes, SMBG is recommended three to four times daily.

Type 2 diabetes

The optimal frequency for SMBG for individuals with type 2 diabetes is not known but should be sufficient to facilitate reaching glucose goals.

Accuracy of Self-Monitoring of Blood Glucose Measurements

SMBG is instrument and user dependent. It is important for health care providers to evaluate the individual's monitoring technique, both initially and at regular intervals. Use of calibration and control solutions on a regular basis by will help assure accuracy of results.

Interpretation of Self-Monitoring of Blood Glucose Data

Optimal use of SMBG requires proper interpretation of the data. Patients using SMBG should be taught how to use the data to adjust their medical nutrition regimens, exercise, or pharmacological therapy to achieve specific glycemic goals.

TOBACCO-USE STATUS AND COUNSELING

Importance of Smoking Cessation

Cigarette smoking greatly increases a diabetic patient's risk of cardiovascular disease. Smoking cessation may be the most important behavior modification to reduce the risk of cardiovascular disease particularly peripheral vascular disease. It will also reduce the risk of developing emphysema, lung cancer, chronic bronchitis and chronic obstructive pulmonary disease.

Assessment of Tobacco Status

All patients should be assessed for tobacco use at the time of diagnosis. Smoking cessation or reduction should be encouraged of smokers at every visit. Determine:

- How long and how much the patient has smoked.
- If smokeless tobacco is used, how much and how often.
- Whether attempts have been made to quit or to reduce the amount or type of cigarettes smoked.
- If the patient is interested in or ready for a smoking cessation program.

What Health Care Providers Can Do to Encourage Smoking Cessation

1. **Ask :** At each visit, ask about tobacco use, including interest in or readiness to quit.
2. **Advise:** At each visit, strongly advise all tobacco users to quit, communicating concern for their health. Explain all the risks of tobacco use, including how it complicates diabetes.
3. **Assist:** Assist with a quit plan and set a quit date. Provide information about successful ways to quit, including individual and group smoking cessation programs. Consider the use of nicotine replacement therapy, in the form of a patch or gum, or prescribe a non-nicotine medication to reduce the symptoms of withdrawal; these are most effective when used in conjunction with a cessation program.
4. **Arrange:** Schedule follow-up contact either in person or via telephone, preferably during the first week after the quit date and then again within the first month, and provide relapse prevention information.

ASPIRIN THERAPY

Aspirin Therapy

Diabetic men and women have a two to fourfold increase in the risk of dying from cardiovascular disease. It is generally accepted that platelets are contributory to atherosclerosis and vascular thrombosis. Platelets from men and women with diabetes are often hypersensitive *in vitro* to platelet aggregating agents. Low-dose aspirin should be prescribed as a secondary prevention strategy if no contraindications exist. In addition, low-dose aspirin therapy should be used as a primary prevention strategy for diabetic men and women who have other risk factors for cardiovascular disease.

Safety

A major risk of aspirin therapy is gastric mucosal injury and gastrointestinal hemorrhage. These effects are dose related and are reduced to background levels when enteric-coated preparations of 75-325 mg are used once daily. Minor bleeding episodes (epistaxis, bruising, etc) may occur at low doses. Low dose aspirin therapy has not been associated with an increased risk for retinal or vitreous hemorrhage.

Although regular use of nonsteroidal anti-inflammatory drugs can increase the risk for chronic renal disease and impair blood pressure control in hypertensive patients, low dose aspirin has no clinically significant effect on renal function or on blood pressure control.

Recommendations

1. Use aspirin therapy as a secondary prevention strategy in men and women who have evidence of large vessel disease. This includes a history of myocardial infarction, vascular bypass procedure, stroke or transient ischemic attack, peripheral vascular disease, claudication, angina.
2. In addition to treating the primary cardiovascular risk factor(s) identified, consider aspirin therapy as a primary prevention strategy in individuals with type 1 or type 2 diabetes with any of the following:
 - A family history of coronary heart disease
 - Cigarette smoking
 - Hypertension
 - Obesity (>120% desirable weight); BMI >28 in women, >27.3 in men
 - Albuminuria (micro or macro)
 - Elevated Lipids
Cholesterol >200 mg
LDL cholesterol >100 mg/dl
HDL cholesterol <40
Triglycerides >250 mg/dl
3. Use enteric-coated aspirin in doses of 81-325 mg/day.
4. People with aspirin allergy, bleeding tendency, anticoagulant therapy, recent gastrointestinal bleeding or clinically active hepatic disease are not candidates for aspirin therapy.

GESTATIONAL DIABETES

Gestational diabetes (GDM) is defined as glucose intolerance with onset or first recognition in pregnancy. Approximately 4% of pregnancies are complicated by GDM.

Detection and Diagnosis

Screening for GDM should be performed (unless otherwise indicated) between the 24th and 28th week of gestation. The screening test should consist of a 50-g oral glucose load given in the non-fasting state and a plasma glucose measurement 1-hour later. A value of ≥ 140 mg/dl indicates the need for a full diagnosis 100-g 3 hour oral glucose tolerance test (OGTT).

Diagnosis of gestational diabetes is based on results of the 100-g 3-h OGTT interpreted according to the diagnostic criteria of O'Sullivan and Mahan. The diagnosis requires two or more of the venous plasma glucose values to meet or exceed the following values:

Fasting	105 mg/dl
1 hour	190 mg/dl
2 hour	165 mg/dl
3 hour	145 mg/dl

Nutritional Counseling

All women diagnosed with gestational diabetes should receive nutritional counseling by a registered dietitian. The nutritional meal plan should include the provision of adequate calories and nutrients to address the needs during the prenatal period and should be consistent with the established maternal glucose goals. Intake of sucrose and other caloric sweeteners should be limited.

Insulin therapy

Insulin therapy is initiated when dietary management does not consistently maintain fasting plasma glucose of ≤ 95 mg/dl and/or 2-h postprandial plasma glucose of ≤ 120 mg/dl. If insulin is prescribed, only human insulin should be used and daily self-monitoring of blood glucose should guide the doses and timing. Oral glucose lowering agents are not recommended during pregnancy.

Other Management Issues

- Increase fetal surveillance, especially if fasting glucose consistently exceeds 105 mg/dl. The specific technique, frequency and initiation depend upon the clinical characteristics of mother and fetus.
- Women should be encouraged to start or continue a program of moderate exercise.
- Noncaloric sweeteners may be used in moderation.
- Breast-feeding, as always, should be encouraged.

**Postpartum Follow-up Care in
Women with Gestational Diabetes**

- At least 6 weeks postpartum, women with gestational diabetes should be screened for diabetes with a fasting plasma glucose. If normal, testing should be considered every 1-3 years.
- Women should be educated regarding lifestyle modifications that lessen insulin resistance, including maintenance of normal body weight.
- Medications that worsen insulin resistance, i.e., glucocorticoids, should be avoided if possible.
- Advise all women to seek medical attention if they develop symptoms suggestive of hyperglycemia.
- Provide family planning to assure optimal glycemic regulation from the start of any subsequent pregnancy. Low dose estrogen oral contraceptives may be used in women with prior gestational diabetes.

PRE-EXISTING DIABETES PRECONCEPTION COUNSELING

Prepregnancy counseling is critical for all women with pre-existing diabetes who are of childbearing age. The health care provider is responsible for providing/referring for prepregnancy counseling. The counseling session must include information on the risk of congenital malformations and ways to prevent them. Contraception, timing of conception, control of metabolic state, self-management techniques, assessment of diabetic complications and other medical complications should all be evaluated.

The treatment goal of preconception counseling is to lower glycated hemoglobin so as to achieve maximum fertility and optimal embryo and fetal development. To achieve this goal, a woman with diabetes must be empowered to take control of her own disease process. Practical self-management skills essential for glycemic control and preparation for pregnancy include:

- Using an appropriate meal plan
- Using carbohydrate and glucagon for hypoglycemia
- Timing meals and snacks
- Reducing stress and coping with denial
- Planning physical activity
- Testing capillary blood glucose
- Choosing time and site of insulin injections
- Self-adjusting insulin doses

Laboratory Evaluation

Certain tests are critically important before conception to evaluate level of metabolic control, presence of diabetic complications, or concomitant disease. These may include:

- Glycated hemoglobin
- Baseline assessment of renal function by creatinine clearance and 24-h microalbumin excretion (microalbumin/creatinine ratios or other methodologies for measuring glomerular filtration rates are acceptable) undertaken before conception and followed at regular intervals
- Thyroid function tests
- Other tests as indicated by physical exam or history

Pre-pregnancy Visits

Pre-pregnancy visits are essential in the management of every woman with diabetes contemplating pregnancy. The frequency of pre-pregnancy visits will depend on the individual needs of the patient. Self-management techniques should be reviewed and modified as necessary. These sessions are used primarily for patient education, motivation and instruction.

- Appropriate modification of the meal plan to address nausea and vomiting
- Gestational weight gain goals
- Risk assessment and prevention of fasting hypoglycemia
- Insulin adjustment algorithms to achieve target glucose control

Early Pregnancy Management

At the earliest possible time after conception, the woman should be seen by her provider. Emphasis should be placed on the following:

- Meal planning to include appropriate calcium, folic acid, and other vitamin intake

- Preprandial
70-100 mg/dl
- Postprandial
1 hour < 140 mg/dl
2 hour < 120 mg/dl

- Psycho-social concerns

DIABETES AND EXERCISE

Evaluation Before Beginning Exercise Program

Before beginning an exercise program the individual with diabetes should undergo a detailed medical evaluation with appropriate diagnostic studies. This should include screening for the presence of macro-and microvascular complications that may be worsened by the exercise program. A careful medical history and physical should focus on the symptoms and signs of disease affecting the heart, blood vessels, eyes, kidneys, and nervous system.

1. Cardiovascular system

A graded exercise test may be helpful if a patient, about to embark on a moderate to high intensity exercise program, is at high risk for underlying cardiovascular disease based on the presence one of the following criteria

- Age >35 years
- Type 2 diabetes of >10 years duration
- Type 1 diabetes of >15 years
- Presence of an additional risk factor for coronary heart disease
- Presence of microvascular disease (retinopathy or nephropathy, including microalbuminuria)
- Peripheral vascular disease
- Autonomic neuropathy

In some patients who exhibit nonspecific ECG changes in response to exercise, or who have had nonspecific ST and T wave changes on the resting ECG, alternative tests such as radionuclide stress testing may be performed. In patients planning to participate in low-intensity forms of exercise (<60% of maximal heart rate) such as walking, the health care provider should use clinical judgement in deciding whether to recommend an exercise stress test.

Patients with known coronary artery disease should undergo a supervised evaluation of the ischemic response to exercise, ischemic threshold, and the propensity to arrhythmia during exercise. In many cases, left ventricular systolic function at rest and during response to exercise should be assessed.

2. Peripheral Arterial Disease

Evaluation of peripheral arterial disease is based on signs and symptoms, including intermittent claudication, cold feet, decreased or absent pulses, atrophy of subcutaneous tissues and hair loss.

3. Retinopathy

For individuals who have proliferative diabetic retinopathy, active, strenuous activity may precipitate vitreous hemorrhage or traction retinal detachment. These individuals should avoid anaerobic exercise and exercise that involves straining, jarring, or Valsalva-like maneuvers.

4. Nephropathy

Specific exercise recommendations have not been developed for individuals with incipient or overt nephropathy. Individuals with overt nephropathy often have reduced capacity for exercise, which leads to self limitation in activity level.

Although there is no clear reason to limit low to moderate intensity forms of activity, high intensity or strenuous exercise should probably be discouraged in these individuals.

5. Neuropathy: Peripheral

Peripheral neuropathy may result in loss of protective sensation in the feet. Significant peripheral neuropathy is an indication to limit weight-bearing exercise. Repetitive exercise on insensitive feet can ultimately lead to ulceration and fractures. Evaluation of peripheral neuropathy may be made by checking the deep tendon reflexes, vibratory sense, and position sense. Touch sensation is best evaluated using monofilaments.

6. Neuropathy: Autonomic

The presence of autonomic neuropathy may limit an individual's exercise capacity and increase the risk of an adverse cardiovascular event during exercise. Cardiac autonomic neuropathy may be indicated by resting tachycardia (>100 beats per minute), orthostasis (a falling in systolic blood pressure >20 mm/Hg upon standing). Sudden death and silent myocardial ischemic have been attributed to cardiac autonomic neuropathy in diabetes. Resting or stress thallium myocardial scintigraphy is an appropriated noninvasive test for the presence and extent of macrovascular coronary artery disease. Hypotension and hypertension after vigorous exercise are more likely to develop in individuals with autonomic neuropathy, particularly when starting an exercise program. Because these individuals may have difficulty with thermoregulation, they should be advised to avoid exercise in hot or cold environments and to be vigilant about adequate hydration.

General Considerations

Preparing the individual with diabetes for a safe and enjoyable exercise program is as important as exercise itself. The young individual in good metabolic control can safely participate in most activities. The middle-aged and older individual with diabetes should be encouraged to be physically active.

A standard recommendation for individuals with diabetes as for nondiabetics is that exercise includes a proper warm up and cool-down period. There are several considerations that are particularly important and specific for the individual with diabetes including:

- Aerobic exercise should be recommended but taking precautionary measures for exercise involving the feet is essential for many individuals with diabetes.
- Prevent trauma to the feet (especially important for individuals with peripheral neuropathy). Use silica gel or air midsoles to prevent trauma. Use polyester or blend (cotton-polyester) socks to prevent blisters and to keep feet dry.
- Wear proper footwear. Individuals must be taught to monitor closely for blisters and other potential damage to their feet, both before and after exercise.
- A diabetes identification bracelet or shoe tag should be clearly visible when exercising.
- Maintain hydration-dehydration can adversely effect blood glucose levels and heart function.
- During exercise, fluids should be taken early and frequently in an amount sufficient to compensate for losses in sweat reflected in body weight loss or the maximal amount of fluid tolerated.
- Precaution should be taken when exercising in extremely hot or cold weather.
- High resistance exercise using weights may be acceptable for young individuals with diabetes but not for older individuals or those with long-standing diabetes. Moderate weight training using light weights and high repetitions can be used for maintaining and enhancing upper body strength in nearly all patients with diabetes.

References

1. American Diabetes Association (1999). Clinical practice guidelines. Diabetes Care vol.22, Suppl 1, S1-S114.
2. Diabetes Control and Complications Trial Research Group (1993). The effect of intensive treatment of diabetes on the development and progression of long term complications in insulin-dependent diabetes mellitus. New England Journal of Medicine, 329, 977-986.
3. UK Prospective Diabetes Study Group (1998). Intensive blood glucose control with sulfonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes. Lancet, 352, 837-853.
4. American Diabetes Association Consensus Guidelines (1993). The treatment of hypertension in diabetes. Diabetes Care, 16, 1394-1400.
5. Monk, A., Barry B., McClain K., Weaver T., Cooper N., & Franz M.J. (1995). Practice guidelines for medical nutrition therapy provided by dietitians for persons with non-insulin dependent diabetes. The Journal of the American Dietetic Association, 95, 999-1006.

This publication was produced by the Department of Health and Social Services, Division of Public Health, Section of Epidemiology, in order to assist health care providers in the diagnosis, treatment and control of diabetes. It was funded in part by the Centers for Disease Control and Prevention, Cooperative Agreement #U32/CCU002144.